2002 Cancer in Washington

Annual Report of the
Washington State Cancer Registry

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Executive Summary

The annual report of the Washington State Cancer Registry (WSCR) summarizes information on new cases of cancer (incidence) and death due to cancer (mortality) for Washington state residents. It represents the ongoing effort by the Department of Health, the Fred Hutchinson Cancer Research Center, health care facilities, physicians, and cancer registrars throughout Washington.

This report constitutes the first half of a two-part web-based report. In addition to the information currently posted, the final report will include information by race and ethnicity. An additional report describing the 11 year cancer incidence and mortality trends in Washington is also under development.

Cancer is a heterogeneous group of diseases characterized by uncontrolled growth and spread of abnormal cells. The various forms of cancer were responsible for 10,840 deaths among Washington residents in 2002, comprising approximately twenty-five percent of all deaths. In 2002, cancer (all types combined) was the most common cause of death among adults ages 45 to 74 and the second leading cause across all age groups. Some form of cancer will likely strike one in three Washingtonians in their lifetime. In 2002, there were 31,119 new cases of cancer diagnosed in Washington.

The report provides information on cancer of all types combined and the 24 cancer sites most frequently diagnosed in Washington residents. The information can be used at the state and county level to identify the burden of morbidity and mortality associated with each type of cancer. Combined with information on cancer prevention, early detection, and treatment, such information is useful for program planning and policy development aimed at reducing the burden of cancer.

The five most common types of cancer reported among Washington residents during 2002 were breast, prostate, lung, colorectal, and melanoma.

1 5,675 new cases and 760 deaths from female breast cancer were reported in 2002. Breast cancer was the second most common cause of cancer mortality for women. Although the age-adjusted rate of new breast cancers diagnosed in Washington women in 2002 was higher than the national rate, the rate at which Washington women die of breast cancer was lower than the rate for the U.S. as a whole. The causes for most breast cancers are unclear, and many of the major known risk factors are not readily modifiable. Among those which can be modified, obesity and alcohol consumption, especially more than one drink per day, have been associated with an increased risk of breast cancer, and physical activity with a decreased risk.[1,2] The best strategy for prevention of breast cancer mortality is early detection through mammography screening.[1,2] In 2002, approximately one fourth of Washington women ages 40 to 65 had not met the National Cancer Institute's recommendation for mammography screening once every one to two years.[1]

2 4,484 new cases and 619 deaths from prostate cancer were reported for 2002. It was the second leading cause of cancer death among men. No effective means are currently available to prevent the development of prostate cancer and experts continue to disagree on the benefits of screening for early detection of prostate cancer.[1,2,3]

3 3,777 new cases of lung cancer were reported in 2002. 3,093 Washingtonians died of lung cancer, making it the leading cause of cancer mortality. The age-adjusted rate of new lung cancer cases in Washington was higher than the national rate, while mortality

rates were similar. Reduction in smoking remains the major focus of efforts to prevent lung cancer.[4]

4 2,768 new cases and 963 deaths from colorectal cancer were reported in 2002. The age-adjusted rate for new cancers of the colon and rectum was lower in Washington than in the U.S. as a whole. Washington's mortality rate was also slightly lower than the national rate. Regular screening has been shown to reduce mortality.[1,2,3] In 2002, approximately one-half of Washington residents met the American Cancer Society's recommendations for screening. Research indicates that diets high in fat, protein, calories, alcohol and meat and low in calcium and folate may increase risk for colorectal cancer.[1] The American Cancer Society recommends a diet that includes at least five servings of fruit and vegetables every day and several servings of foods from other plant sources, such as grain products, rice or beans.[2] Regular physical activity may reduce the risk for cancer of the colon and rectum, and smoking may increase risk.[1,2]

5 2,224 new cases and 155 deaths from melanoma of the skin were reported in 2002. The age-adjusted rate for new melanomas was higher in Washington than in the U.S.; the mortality rates, however, were the same. Washington's racial distribution most likely plays some role in the elevated incidence rates. Rates are generally highest among white people, and in Washington, 82% of the population reported white as their only race on the 2000 U.S. Census compared to 75% nationally.[5,6] Nonetheless, in 2001, incidence rates for whites-only were still higher in Washington than in the U.S., while mortality rates remained similar. In 2004, the National Cancer Institute revised its assessment of risk factors and now notes that there is inadequate evidence to decide if the avoidance of sunburns is effective in reducing incidence of melanoma. It also notes that there are conflicting findings on sunscreen use, with differing studies indicating that such use may either decrease risk, or, because sunscreen users may extend their exposure to the sun, increase risk.[1] The American Cancer Society recommends routine examination of the skin for reducing mortality from melanoma.[2] The National Cancer Institute advises patients that routine examination of the skin increases the chances of finding melanoma while it is still in an early, treatable stage.[1]

Preface

This annual report of the Washington State Cancer Registry (WSCR) incorporates cancer incidence data for the entire state. It represents the ongoing effort by the Department of Health, the Fred Hutchinson Cancer Research Center, hospitals and other health care facilities, physicians, and cancer registrars throughout Washington. This information is presented in the hope that it will assist health care providers, public health officials, voluntary organizations, and concerned citizens in their efforts to prevent and control cancer in Washington.

This report constitutes the first section of a two-part final report. In addition to the information currently posted, the final report will include information by race and if possible, ethnicity. A separate report on trends in Washington is also under development.

Introduction

Cancer is a heterogeneous group of diseases characterized by uncontrolled growth and spread of abnormal cells. In 2002, there were 31,122 new cases of cancer diagnosed in Washington. The various forms of cancer were responsible for 10,846 deaths among Washington residents in 2002, comprising approximately twenty-five percent of all deaths. In 2002, cancer (all types combined) was the most common cause of death among adults aged 45 to 74 years and the second leading cause across all age groups. Some form of cancer will likely strike one in three Washingtonians in their lifetime.

Illness and death due to cancer are increasingly preventable through two types of strategies. Primary prevention strategies aim to reduce, usually through lifestyle change, the likelihood that a healthy individual will develop cancer. Secondary prevention is accomplished by screening asymptomatic people to diagnose cancers at an early, more readily treatable stage.

This report summarizes information on new cases of cancer (incidence) and deaths due to cancer (mortality) for Washington state residents and for comparative purposes, the U.S. as a whole. The report provides information on cancer of all types combined and the 24 cancer sites most frequently diagnosed in Washington residents. This information can be used at the state and county level to identify the burden of morbidity and mortality associated with each type of cancer. Combined with information on cancer prevention, early detection, and treatment, this information is useful for program planning and policy development aimed at reducing the burden of cancer.

The Five Most Common Cancer Sites

The most common types of cancer reported among Washington residents during 2002 were breast, prostate, lung, colorectal, and melanoma.

1 5,675 new cases of female breast cancer were reported in 2002. Breast cancer was by far the most frequently diagnosed cancer among women. Responsible for 760 deaths in 2002, it was the second most common cause of cancer mortality for women.

While the age-adjusted rate of new breast cancers diagnosed in Washington women in 2002 continued to be higher than the national comparison rate, the rate at which Washington women died of breast cancer continued to be below the national rate. This pattern has been evident for several years. In fact, for each of the three years that national and state-specific rates have been reported (1999, 2000 and 2001), Washington's rates of diagnosing women with invasive breast cancer were the highest in the nation.[7]

The Washington State Department of Health has determined that a portion of the high rate of breast cancer is related to relatively older ages at which Washington women have their first child compared to the U.S. as a whole. Other factors, such as rates of screening mammography, Washington's racial and age distribution, and the completeness of WSCR data do not seem to play a role.[8]

Additionally, while early stage at diagnosis[*] plays a role in survival, stage at diagnosis does not seem to explain the finding that the rate of new breast cancer cases was higher in Washington than in the U.S. as a whole, but mortality rates were lower. Washington women seem to be diagnosed at similar stages as women nationally, based on data available through SEER*Stat Version 5.0.20 client-server mode public use file, April 2003.

Rates of newly diagnosed breast cancer have been increasing in Washington since incidence data was first collected beginning in 1992. From that time to 2002, the age-adjusted incidence rates have increased by about 2% per year. This differs from the national experience where rates increased by 2% per year from 1992 to 1998, but then leveled off and have shown no significant change from 1998 to 2001, the latest year of national data available.

For in situ breast cancers, the trend in Washington between 1992 and 2001 showed an increase in the rates of 5% per year; however, with the addition of 2002 data, the trend appears to be shifting, with the rates showing a 7% per year increase from 1992 to 1998, and a leveling off with no significant changes between 1998 and 2001. Nationally, the rates of in situ breast cancers have been increasing by about 6% per year from 1992 to 2001.

For invasive breast cancers, the rates in Washington increased by about 1.5% per year from 1992 to 2002. Nationally from 1992 to 2001, the rate for invasive breast cancer increased by about 1.5% per year between 1992 and 1998; however, from 1998 to 2001 the national rates leveled off and show no significant change.

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[*] See page 13 for a discussion of stage at diagnosis.

The cause of most breast cancer is unknown and most of the known risk factors are not easy to modify. However, some risk factors are potentially modifiable. The National Cancer Institute and the American Cancer Society agree that obesity and alcohol consumption, especially more than one drink per day, increase the risk of breast cancer, and that physical activity may decrease risk.[1,2]

Early detection through mammography is effective in reducing deaths from breast cancer and is recommended by leading scientific organizations, especially for women between the ages of 50 and 65. The American Cancer Society recommends mammography every year for average-risk women beginning at age 40.[2] The National Cancer Institute and the U.S. Preventive Services Task Force recommend mammography every one to two years for women age 40 and older.[1,3] The 2002 Washington State Behavioral Risk Factor Surveillance System[9] indicates that 40% (± 3%) of women in Washington age 40 and older did not have a mammogram in the past year and 24% (± 2%) had not had a mammogram within the last two years.

2 4,484 new cases of prostate cancer were reported in 2002, making this cancer the most commonly reported malignancy among men. It was the second leading cause of cancer death among men, killing 619 men in 2002.

From 1992 – 1994 the incidence of prostate cancer declined in Washington by more than 16% per year. Since then, the trend has remained essentially flat. This pattern is loosely mirrored in the nation as a whole; U.S. incidence rates fell by 11% per year from 1992 to 1995, but between 1995 and 2001 the trend has remained flat. It is not known whether these differing trends reflect changes in screening practices, true changes in incidence or other factors. Since 1992, Washington's prostate cancer death rates have been decreasing by about 4% per year. Nationally the rates had been falling by about 2% per year from 1992 to 1995, but between 1995 and 2001 they have been falling by 4% per year.

No effective means are currently available to prevent prostate cancer.[1,2,3] The American Cancer Society recommends that health care providers offer prostate-specific antigen blood testing and digital rectal examination yearly for men age 50 and older, who do not have serious medical problems and can be expected to live for at least 10 years. They recommend that screening begin at age 45 for men at high risk, such as men with first-degree relatives with prostate cancer and African American men.[2] In contrast, both the U.S. Preventive Services Task Force and the National Cancer Institute conclude that there is insufficient evidence regarding the benefit of screening in reducing mortality to recommend for or against screening.[2,3]

3 3,777 new cases of lung cancer were reported for 2002. 3,093 Washingtonians died of lung cancer, making it the leading cause of cancer mortality. The age-adjusted rates of new lung cancer cases for both men and women in Washington were higher than the national rates.

Cigarette smoking is the major cause of lung cancer.[1,2] Based on the Behavioral Risk Factor Surveillance Survey[9], from 1990 - 2002, smoking rates were about the same in Washington and the U.S. as a whole. However, lung cancer caused by smoking may take several decades to develop and we do not know whether there was more smoking in Washington than in the U.S. several decades ago. The mortality rates for both sexes

combined in Washington and the U.S. as a whole were similar; however, the rates for men in Washington were lower than those in the U.S., while the rate for women in Washington were higher than in the U.S.

Lung cancer incidence rates for Washington women have not changed since 1992. This differs from the national experience where rates for women increased 1% per year from 1992 to 1998, and then began to decrease by 3% per year from 1998 to 2001. For Washington men the rates decreased by 1.5% per year between 1992 and 2002. This pattern is similar to a decrease of 2% per year for men nationally.

Trends for Washington's death rates for lung cancer are more akin to those seen nationally. In Washington and nationally rates for men have been falling by approximately 2% per year. For women the rates in Washington have remained essentially flat since 1992, while nationally they increased 1% per year from 1992 to 1996, but have been flat since from 1996 to 2001.

Approximately 90% of male and 78% of female lung cancer deaths are attributed to smoking, making prevention and cessation the key intervention strategies.[1] Early detection through spiral computed tomography has been successful in detecting early lung cancer in smokers and former smokers, and the National Cancer Institute is currently conducting a large-scale study to determine whether screening smokers through spiral CT will reduce mortality from lung cancer. The study began in 2002 is planned to continue until 2009. So far, it has not found that screening reduces a person's chance of dying from lung cancer.[1] At this time no major scientific organizations recommend routine screening for lung cancer.

4 2,768 new cases of colon and rectal cancer were reported in 2002. For both sexes combined, colorectal cancer continues to be the state's second leading cause of cancer death, resulting in the loss of 963 lives in 2002. The age-adjusted rate for new cancers of the colon and rectum was lower in Washington than in the U.S. as a whole. Washington's mortality rate was also lower than the national rate.

For women and both sexes combined the incidence rates for invasive colorectal cancers in Washington have been declining by about 1% per year from 1992 to 2002. For men only, the trend is essentially flat. Nationally, the trend for invasive colorectal cancer for men and women combined is similar to Washington's, a decrease of about 1% per year from 1992 to 2001; however, for men only the rates have been falling by 1% per year, while those for women have remained essentially flat.

The National Cancer Institute, American Cancer Society, and the U.S. Preventive Services Task Force conclude that screening average-risk individuals beginning at age 50 reduces mortality from colorectal cancer.[1,2,3] The most common screening methods include screening of the stool for invisible amounts of blood (fecal occult blood test or FOBT), visual examination of the lower bowel (sigmoidoscopy), and visual examination of the entire bowel (colonoscopy). The American Cancer Society recommends several screening options, with the preferred option as yearly FOBT combined with sigmoidoscopy every five years.[2] The U.S. Preventive Services Task Force also concludes that the evidence of benefit is strongest for a combination of FOBT and sigmoidoscopy, but the Task Force does not specify screening frequencies.[3] The National Cancer Institute concludes that FOBT every year or every two years reduces death from cancer from colorectal cancer and that sigmoidoscopy may reduce mortality, but there is insufficient evidence to determine how often people should have

sigmoidoscopies.[3] The American Cancer Society recommends more frequent screening, beginning at earlier ages for those who may be more susceptible to colorectal cancer, such as people with a history of colorectal cancer in their family.[2]

The Washington State Behavioral Risk Factor Surveillance System[9] indicates that in 2002, 53% (± 3%), of Washingtonians age 50 and older reported a FOBT in the past year and/or a sigmoidoscopy or colonoscopy in the last five years. This is significantly higher than the 45% (± 2%) seen in the 1997 – 1999 combined data.

The National Cancer Institute states that colorectal cancer most likely results from complex interactions between inherited susceptibility and environmental factors. Research indicates that diets high in fat, protein, calories, alcohol and meat and low in calcium and folate may increase risk for colorectal cancer.[1] The American Cancer Society recommends a diet that includes at least five servings of fruit and vegetables every day and several servings of foods from other plant sources, such as grain products, rice or beans.[2] Regular physical activity may reduce risk especially for cancer of the colon, and smoking and obesity may increase risk.[1,2]

5 2,224 new cases of melanoma of the skin were reported in 2002. Melanoma of the skin accounted for 155 deaths in Washington residents. The age-adjusted rate for new melanomas was higher in Washington than in the U.S. as a whole. Washington's mortality rate was also slightly higher than in the U.S. Differences in the racial distribution of Washington and the U.S. most likely play a role in the differences in the rates. Rates are highest in white people, and in Washington, 82% of the population reported white as their only race on the 2000 U.S. Census compared to 75% nationally.[5,6]

In Washington, rates of melanoma have been increasing by approximately 5% per year from 1992 to 2002 for men. For women, rates showed a sharp 13% per year increase from 1992 to 1995, but since 1995 rates have increased 3% per year. Nationally, rates for men increased 6% per year from 1992 to 1998, but remained flat from 1998 to 2001; for women, national rates increased by nearly 5% per year from 1992 to 2001.

The rate of increase for invasive disease in Washington generally mirrors that seen for all melanomas of the skin combined: for men only and both sexes combined the rates have increase by 3% per year from 1992 to 2002, while for women-only the rates showed a 4% per year increase from 1992 to 2000 but then leveled off and have been essentially flat from 2000 to 2002. Nationally invasive melanoma of the skin rates for both sexes combined had been increasing by 6% per year form 1992 to 1997, and then leveled off and have remained flat from 1997 to 2001. For men-only the national rates of invasive disease increased by 6% per year from 1992 to 1998 but then leveled off and have been flat for 1998 to 2001; for women-only the national rates have been increasing by nearly 5% per year from 1992 to 2001.

Washington death rates for melanoma have not changed for men or women since 1992. This is similar to the national pattern for men For women, however, the national rates decreased approximately 1% per year from 1992 to 2001.

There is evidence that avoiding sunburns and limiting sun exposure can help prevent non-melanoma skin cancers, but recent studies assessing risk factors for melanoma of the skin have had mixed finding. Given these new studies, the National Cancer Institute revised its assessment of risk factors and now notes that there is inadequate evidence

to decide if the avoidance of sunburns is effective in reducing incidence of melanoma. It also notes that there are conflicting findings on sunscreen use, with differing studies indicating that such use may either decrease risk, or, because sunscreen users may extend their exposure to the sun, increase risk.[1] Nonetheless avoiding exposure to the sun through other methods, such as wearing protective clothing, may be important in decreasing risk for melanoma of the skin and continues to be recommended by the National Cancer Institute and the American Cancer Society.[1,2] Avoiding excessive sun exposure is also is important for decreasing the risk of non-melanoma skin cancers.[1, 3]

The National Cancer Institute does not provide consistent advice on the importance of skin examination for early detection of melanoma. While it concludes that there is insufficient evidence that routine examination of the skin (by oneself or by a health care provider) is effective in reducing mortality from melanoma, it also advises patients that routine examination of the skin increases the chance of finding melanoma while it is still in an early, treatable stage.[1] The American Cancer Society does recommend skin examination by a health care professional as part of a routine cancer-related check-up. The American Cancer Society also recommends monthly self-examination and provides guidelines for recognizing signs of the disease. These include moles that are asymmetrical (that is, one side does not match the other), have irregular borders (that is, the edges of the mole are ragged or notched); have more than one color or shade; or are larger than about ¼ inch across. The guidelines can be easily remembered as A (**a**symmetrical), B (irregular **b**orders), C (more than one **c**olor) and D (**d**iameter of more than ¼ inch). A change in the size, shape or color of a mole may also be a sign of melanoma.[2]

Washington State Cancer Registry

Background

In 1990, RCW 70.54.230 made cancer a reportable condition in Washington and mandated the Department of Health to establish a statewide cancer registry program. Under this mandate, the Department established the Washington State Cancer Registry (WSCR) in 1991. The registry is dedicated to fulfillment of the legislative intent "...to establish a system to accurately monitor the incidence of cancer in the state of Washington for the purposes of understanding, controlling, and reducing the occurrence of cancer in this state." Since 1994, funding for WSCR has been provided, in part, through the Centers for Disease Control and Prevention's National Program of Cancer Registries under Public Law 102-515. This program was authorized to establish standards for data collection (completeness, timeliness of reporting and data quality) and provide information for cancer prevention and control programs at the local, state, and national levels.

Certification of central cancer registries began in 1997 to recognize registries meeting data quality standards. This certification, Gold or Silver, is awarded through the North American Association of Central Cancer Registries (NAACCR). The Washington State Cancer Registry has achieved certification recognition each year it has been awarded. In addition, WSCR has been recognized by the Trust for America's Health as one of the top performing state registries in the nation and was one of twelve states to receive an "A" rating.

Data Collection

Cancer cases are collected through a variety of methods. The Cancer Surveillance System (CSS) of the Fred Hutchinson Cancer Research Center provides data on cancer cases from

thirteen counties in Western Washington, covering the majority of the state's population including the largest urban center of Seattle. CSS has been in operation since 1974 as a regional registry participant in the Surveillance Epidemiology and End-Results (SEER) Program of the National Cancer Institute. In other areas of the State, health care facilities, including hospitals, independent laboratories, radiation/oncology treatment centers, ambulatory surgery centers, and providers are responsible for reporting cases to WSCR, either directly or via their association with agencies providing registry services. WSCR also conducts data exchanges with other state cancer registries as authorized. Most of Washington's out-of-state cases are reported by Oregon and Idaho, followed by Texas and Arizona.

Once a cancer case is identified, an abstract of cancer information is completed within six months of diagnosis. Data files are transmitted to the state on a regular basis. WSCR is responsible for merging the data, conducting quality assurance in accordance with national standards, and disseminating cancer information to assist with cancer prevention and control efforts statewide. Annual on-site audits are conducted to insure all reportable cases are submitted.

The cancer reporting rules (246-102 WAC) currently define reportable cancers as "any malignant neoplasm, with the exception of basal and squamous cell carcinoma of the skin." Also specifically included are: 1) basal and squamous cell carcinoma of the external genital organs (vulva, labia, clitoris, prepuce, penis, anus, scrotum); 2) all brain and central nervous system tumors; 3) cancer in situ, except cancer in situ of the uterine cervix, and 4) certain hematopoietic conditions that have been recognized as pre-malignant. The legally required data for cancer reporting include patient demographics (such as age and sex) and medical information (such as type of cancer and date and stage at diagnosis) for all newly diagnosed cancers. Copies of Washington's cancer reporting legislation and regulations are available on request.

Report Contents

This report includes a chapter summarizing the incidence and mortality for all cancers combined and for the 24 cancer sites most frequently diagnosed in Washington residents. In addition to the chapters for each site, there are also introductory charts showing the relative frequency of the leading causes of cancer incidence and mortality and the age distribution of cancer diagnoses. Appendices include technical notes, sources of information on the epidemiology and prevention of cancer, the membership of the WSCR Advisory Council and WSCR contact information.

The report focuses on cases of cancer newly diagnosed between January 1, 2002 and December 31, 2002, and reported to WSCR as of September 2004. For some sections, other years of cancer incidence data are used, as well. Cancer incidence information is for residents of the entire state and also includes new cases of cancer among Washington residents diagnosed in other states, such as Oregon and Idaho. Mortality statistics focus on deaths among Washington residents that occurred in 2002 where the underlying cause of death was cancer. The cancer may have been diagnosed before 2002. As with incidence, some sections use mortality data from additional years and mortality data include Washington residents who die out-of-state.

The following material briefly describes the tables, graphs and charts presented in the chapters for each of the 24 cancer sites. It includes short discussions of the statistical methods used to produce each table, graph or chart, and special considerations for interpreting the data.

Tables, Charts and Graphs

Data Definitions and Sources

The Washington State Cancer Registry provides the number of new cases (incidence) of cancer as described above. Based on estimates of the expected number of cancer cases, the registry includes more than 95% of cases. Beginning in 2001, each cancer is coded to an International Classification of Diseases Oncology Third Edition (ICD-O-3) code. Data from earlier years is coded to the ICD-O Second Edition (ICD-O-2). The transition from ICD-O-2 to ICD-O-3 recognized and addressed advancements in diagnosing cancers that resulted in pathologists being able to provide more specific information about certain cancers. The most significant of these changes are seen in the coding schemes for lymphoma and leukemia.

For 22 of the 24 cancer sites covered in this report, the change from ICD-O-2 to ICD-O-3 reflects a more specific designation of an NOS (not otherwise specified) term. For leukemia and non-Hodgkin lymphoma, the ICD-O-3 added approximately 200 terms and synonyms. In the process of reorganizing the coding for lymphoma and leukemia, terms were moved to different codes and/or combined with other codes. The definition box for each leading cause of cancer provides the ICD-O-3 codes. We have used definitions that are consistent with those used by the National Cancer Institute's SEER program.

The Washington State Department of Health, Center for Health Statistics provides information from death certificates on the number and causes of death. According to the National Center for Health Statistics, more than 99% of all deaths occurring in the United States are registered in the death certificate system. Accuracy of reporting specific causes of death varies since classification of disease conditions is a medical-legal opinion subject to the best information available to the physician, medical examiner, or coroner certifying the cause of death. We obtained the number of cancer deaths from the Vital Registration System Annual Statistical Files, Washington State Deaths 1980-2002 CD-ROM issued November 2003.

From 1980 –1998, the underlying cause of death was coded using the International Classification of Diseases, 9th Revision (ICD-9) coding system. Consistent with national requirements, the Department of Health began using the International Classification of Diseases, 10th Revision (ICD-10) beginning with deaths occurring in 1999. While the change from the ICD-9 to the ICD-10 resulted in substantive changes in rates for some causes of death, the effect of the coding change is small for cancer. Information on the comparability of ICD-9 and ICD-10 codes is available from the National Center for Health Statistics (http://www.cdc.gov/nchs/datawh/nchsdefs/comparabilityratio.htm).

The data definition provides the ICD-10 codes used in each section. We have used definitions that are consistent with those used by the SEER program. **For some types of cancer, including brain, colorectal, endometrial, liver, leukemia, lung, multiple myeloma and thyroid, the SEER coding differs from the National Center for Health Statistics coding.** Before comparing information from different reports, one must be sure that the definitions are consistent.

Population data necessary for the calculation of rates are from the Washington State Office of Financial Management, November 2003. These include intercensal interpolations for 1992 – 1999, U.S. Census data for 2000, and postcensal estimates for 2001 and 2002.

Incidence and Mortality Summary

These tables provide the number of new cases of cancer and the number of cancer deaths for Washington State residents in 2002. Since the numbers of new cases and deaths depend, in part, on the size of the population, we converted numbers to rates (e.g., the number of cases per 100,000 people) so that they may be compared among different regions or populations. For diseases, such as cancer, where incidence varies with age, the rates are age-adjusted to minimize the effect of different age distributions when comparing two geographic regions or populations.

Following national standards, we have age-adjusted rates to the 2000 U.S. standard population. **When making comparisons, one must be careful to compare age-adjusted rates that are adjusted to the same standard population and are calculated in the same manner.** Following the National Cancer Institute's standard method for age-adjustment, we have used 18 age groups to age-adjust. This is different from the standard 11 age groups used by the National Center for Health Statistics. For this reason, the rates in this report may differ slightly from those published in other state or national reports. Detail on our age-adjustment method is provided in Appendix A.

The final row of the incidence tables provides age-adjusted incidence rates from the twelve National Cancer Institute's SEER regions. These rates are from SEER*Stat version 5.3.1 client-server mode, public use file, April 2004. The final row of the mortality tables provides age-adjusted mortality rates for the U.S. These rates are available for the total U.S. population through SEER*Stat version 5.3.1 client-server mode public use file. SEER obtains these data from the National Center for Health Statistics. The SEER programs do not include data for 2002. Since cancer incidence and mortality rates do not change rapidly, we have provided 2001 national data for comparison.

Stage at Diagnosis

Stage at diagnosis refers to how far a cancer has spread from its site of origin when it is diagnosed. The stages, in order of increasing spread, are in situ, local, regional and distant. Cancers staged as local, regional, or distant are referred to as invasive. The reader should note that many publications of the National Cancer Institute and the Centers for Disease Control and Prevention report rates of invasive cancer only. Thus, caution must be exercised when comparing incidence rates contained in different reports.

The WSCR data contain the stage of disease at diagnosis coded according to the SEER guidelines.

In Situ	A tumor that fulfills all microscopic criteria for malignancy, but does not invade or penetrate surrounding tissue.
Localized	A tumor that is invasive but remains restricted to the organ of origin.
Regional	A tumor that has spread by direct extension to immediately adjacent organs or tissues and/or metastasized (spread through the blood stream) to regional lymph nodes, but appears to have spread no further.
Distant	A tumor that has spread by direct extension beyond the immediately adjacent organs or tissues, and/or metastasized to distant lymph nodes or other distant tissues.
Unstaged	Insufficient information available to determine the stage of disease at diagnosis.

We have provided the frequency distribution of cases according to their stage at diagnosis.

For most cancers, diagnosis at an early stage (in situ or local) results in improved survival. One standard measure of survival is the five-year survival rate that estimates the proportion of individuals with a given cancer who are living five years after diagnosis. We have not developed five-year survival rates for Washington state residents. However, we have provided the SEER five-year survival rate for each cancer. These statistics were obtained from SEER*Stat version 5.3.1 client server mode public-use file, April 2004. This data file provides survival rates by stage of disease at diagnosis. The national five-year relative survival rates are calculated for cancer cases diagnosed between 1996 and 2000, based on follow-up of patients through 2001. The National Cancer Institute defines the relative five-year survival rate as the likelihood that a patient will not die from causes associated with their cancer within five years. The SEER*Stat program calculates this rate using a procedure described by Ederer, Axtell, and Cutler whereby the observed survival rate is adjusted for expected mortality.[10] It is always larger than the observed survival rate.[11]

Incidence and Mortality Rate Trends

These charts provide incidence and mortality rates from 1992 – 2002 for Washington residents per 100,000 population, age-adjusted to the U.S. 2000 standard population. (See "Incidence and Mortality Summary" for a discussion of age-adjusted rates.) These tables show changes in rates over time for females, males and the total population. As described in Data Definitions and Sources above, there were coding changes for new cancer cases in 2001 and for causes of death in 1999. For new cancer cases, the coding changes did not result in discontinuities from earlier data for the 24 cancer sites covered in this report. The same is true for death from cancer.

Incidence and Mortality Rates by County

We have presented the average annual age-adjusted cancer incidence and mortality rates for Washington residents per 100,000 population by county. (See Incidence and Mortality Summary for a discussion of age-adjusted rates.) Because of the small size of many counties and the relative rarity of some types of cancer, the incidence and mortality rates based on one year of data are not stable (i.e., there is some random fluctuation in rates from year to year). Therefore, for county rates, we have combined three years of data (2000-2002) to compute average annual age-adjusted rates for the three-year period.

The state rates and 95% confidence intervals are included for comparison purposes. While the incidence and death statistics in this report are not subject to sampling error, they may be affected by random variation. The confidence interval is used to describe the range of that variation.

When the confidence interval for the rate of interest does not overlap with the confidence interval for the comparison rate, the two rates are statistically significantly different, i.e., the difference between the two rates is more than that expected by random variation or chance. However, if we are making many comparisons, we may still find statistically significant differences just by chance. In fact, with a 95% confidence interval, we expect that 5% of the comparisons will be statistically significant by chance. If, for example, we compare rates for 24 cancer sites in 39 counties to state rates, we make 936 comparisons (24 times 39). Just by chance alone, we expect to see statistically significant differences for about 46 (5% of 936) of those comparisons.

If the confidence interval for the rate of interest (for example, a confidence interval around a county rate) includes the rate for the comparison area (for example, the state rate), the rates are not statistically significantly different. When confidence intervals for the rate of interest and the comparison rate overlap, but the interval for the rate of interest does not include the rate for the comparison area, the differences may or may not be statistically significant and formal statistical testing may be needed.

Even with a three-year average, rates may fluctuate widely when there are a small number of cases. Therefore, we omit the rate and confidence intervals when there are fewer than five cases for the three-year period. Details of our methods for calculating confidence intervals are in Appendix A.

What's Missing

Information on Prevention, Early Detection, and Treatment

Illness and death due to cancer are increasingly preventable through the application of growing knowledge about the causes of cancer, improved screening, and early diagnosis techniques, and more effective treatment. Extensive information on prevention through changing modifiable risk factors, early detection through routine screening, and preferred treatment modalities is available. We have not attempted to reproduce this information in detail. However, a brief summary of the most important public health aspects of cancer prevention and control follows in the paragraphs below. Appendix B provides a resource list for those interested in more detail.

Screening for early detection has a clear role in reducing the disease burden due to cancer of the female breast, the uterine cervix, and colorectal cancer.[1,2,3] Experts do not agree on the value of routine screening of asymptomatic, average risk individuals for other types of cancer. However, the American Cancer Society supports clinical examination for early detection of prostate, skin, oral and testicular cancers, and self-examination for skin cancer.[1]

Major reductions in cancer rates and in an individual's likelihood of developing cancer are achievable through primary prevention strategies.

- The elimination of tobacco use would markedly reduce the incidence of lung cancer, as well as cancers of the oral cavity, pharynx, and esophagus. It would also reduce the incidence of bladder, kidney, pancreatic, and cervical cancer, and may reduce the incidence of colorectal cancer.[2]
- Diets high in fruit and vegetables may reduce the risk for cancer of the oral cavity, esophagus, stomach, prostate, and cervix. Diets low in fat, especially animal fat, might reduce risk of cancer of the prostate, breast, colon and rectum, and endometrium.[1] The American Cancer Society recommends eating at least five servings of fruits and vegetables each day; choosing whole grains in preference to processed grains and sugars; and limiting consumption of red meat, especially those high in fat and processed.[2]
- Regular, moderate exercise has also been shown to have some benefit in the prevention of cancer at a number of sites, such as colorectal and breast.[1] For optimal health, the U.S. Surgeon General recommends at least 30 minutes of moderate physical activity on five days a week.[12]
- Maintaining the proper body weight through a combination of a healthy diet and physical activity is important for cancer prevention. Obesity has been associated with an increased risk of cancers of the breast, colon, prostate, endometrium, cervix, ovary,

kidney and gallbladder. Obesity may also be associated with cancers of the liver, pancreas, rectum and esophagus. Most likely the reasons for these associations are different for different types of cancer.[1]

The overall health benefit of these habits, and their lack of countervailing risk, makes them wise choices for cancer prevention. Health care providers, public health agencies, and voluntary organizations can provide the education that helps people make healthy choices.

While individual behavior plays an important role in cancer prevention, governmental and other societal entities have key roles as well. Policies and regulations that, for example, ban cigarette smoking, reduce youth access to tobacco, provide environments that encourage physical activity and healthy food choice, assure delivery of health services and control occupational exposures are important for preventing and controlling cancer.

Approaches for reducing the burden of cancer in Washington are included in the Washington State Comprehensive Cancer Control Plan.[13] The plan was developed by Washington's Comprehensive Cancer Control Partnership that includes cancer care providers, researchers, public health professionals, advocates, survivors, and others interested in cancer prevention and control. In establishing preliminary priorities, the Partnership relied on WSCR data to assess the burden of cancer in Washington. The overall purpose the plan is to facilitate a systematic approach to planning and implementing effective strategies to reduce the burden of cancer. The plan

- Provides a framework and guide for coordinated and integrated statewide efforts to reduce the burden of cancer.
- Highlights important cancer issues for future prioritization.
- Sets goals and objectives for improvement.
- Proposes evidence-based or theory-based strategies to achieve goals and objectives.
- Draw interested organizations and individuals together to work collaboratively toward shared goals.

Cancer by Race and Ethnicity

Background on Race and Ethnicity

Beginning in 1997, the US Office of Budget and Management (OMB), defined five races including American Indian or Alaska Native (AIAN), Asian, African-American or black, Native Hawaiian or other Pacific Islander (NHOPI) and white. This classification represents a change from the earlier standard that combined Asians, Native Hawaiians and other Pacific Islanders into one group called Asians or Pacific Islanders (API). The OMB guidelines called for adopting this classification system by January 1, 2005. The 1997 guidelines also specified that people could be identified as more than one race, whereas previously, one race had been the standard. The 1997 OMB defined ethnicity as Hispanic or non-Hispanic and guidelines called for information on ethnicity to be collected separately from race. This guideline is the same as the pre-1997 OMB standard. Following OMB guidelines, every individual is classified as Hispanic or non-Hispanic ethnicity and as one or more of the five race groups.

The cancer reporting rules require that the race and ethnicity information from the medical record included in the data provided to WSCR. Since 2000, WSCR has allowed for the reporting of more than one race, but only approximately 0.3% of WSCR records have more than one race. Additionally, the number of Asians, Native Hawaiians and other Pacific Islanders in WSCR is relatively small. Therefore, this report uses the pre-1997 OMB standard with regard to race: race data are for four groups (AIAN, API, black or African American, and white) and for single race only. Following standards for the North American Association of Central Cancer Registries, WSCR records with two races are assigned to the non-white race or to the first race recorded if both races are non-white. When more than two races are recorded, the first non-white race is selected.

The concepts of race and ethnic group and the meaning assigned to these concepts have changed considerably over time. The standard race and ethnic groups are not only biologically heterogeneous, but also culturally diverse. Factors such as education and income, country of origin or heritage, religious and cultural practices, and how long people have lived in the United States affect the environments in which people live and work and their lifestyles. Environments and lifestyles, in turn, affect cancer rates. At best, race may be viewed as a rough proxy for socioeconomic status, culture, and genetics. (See Racial and Ethnic Groups in Data Analysis.)

In spite of this heterogeneity, different racial and ethnic groups have different patterns of cancer incidence and mortality. Many organizations involved in reducing the burden of cancer provide outreach to specific racial and ethnic groups. Knowledge of what may be most important for different groups will help them in their work. Additionally, the federal Healthy People 2010 initiative outlines the goal of reducing health disparities among racial and ethnic groups. The Washington State Department of Health has adopted this goal as a priority. To determine whether disparities exist, we must first assess patterns of disease by race and ethnic group.

In previous reports (1997 and 1998), we reported on three race groups, API, black, and white. We did not include data for AIAN race or Hispanic ethnicity, because a comparison of WSCR and death certificate data from 1992 – 1996 indicated that people in these groups were underreported. Additionally, a study linking Indian Health Services data to WSCR revealed that American Indians were often reported as white and therefore, underreported in WSCR.[14] WSCR has since taken steps to address the issue

of underreporting for AIAN race through linkages with the Indian Health Service and the Northwest Portland Area Indian Health Board. For Hispanic ethnicity, WSCR has aggressively followed back with facilities and health care professionals to capture and update this information

To assess the quality of race in WSCR, we linked WSCR data from 1998 – 2001 with death certificate data from 1998 – 2002 and compared race and ethnicity in the two data sources. Approximately 99% of those recorded as white, 97% recorded as black, 96% recorded as API, 86% recorded as AIAN, and 91% recorded as Hispanic on the death certificate were recorded as such in WSCR. Additionally, about 90 people recorded as white on the death certificate were recorded as AIAN in WSCR and 185 recorded as Hispanic in WSCR were recorded as non-Hispanic on the death certificate. While it is difficult to determine whether WSCR is assigning people to these groups who should not be assigned or whether they are misreported on the death certificate, there is evidence that AIAN race and to a lesser extent, Hispanic ethnicity are underreported on the death certificate.[15,16] Given this evidence and the methods WSCR used to assign AIAN race and Hispanic ethnicity, we have concluded that the data for 2001 and 2002 are of sufficient quality to report cancer rates for all four race groups and Hispanic ethnicity. However, since the methods used to ascertain AIAN race and Hispanic ethnicity in Washington are not followed nationally, cancer incidence rates for these groups in Washington for 2001 and 2002 might not be comparable to national cancer data.

Leading Causes of Cancer by Race and Ethnic Group

We have included information on all cancer sites combined and 15 specific sites that include the 10 cancer sites most frequently diagnosed for each race and ethnic group. Cancer of the breast, prostate, lung, and colon and rectum are the four most frequently diagnosed cancer sites for all race and ethnic groups. General information on these cancers is available in the section, The Five Most Common Cancer Sites.

Breast Cancer (female)

From 2000 – 2002, breast cancer was the most commonly diagnosed cancer among Washington residents of all race and ethnic groups, except for blacks. It was the third most commonly diagnosed cancer among blacks. Similar to the pattern seen nationally, among the four race groups, white women had the highest rates of newly diagnosed breast cancer, but black women had the highest rates of death from breast cancer. This pattern has persisted for many years and speaks to the need for improvements in early detection and treatment of breast cancer in black women. Non-Hispanic women had higher rates than Hispanics for both newly diagnosed breast cancer and death.

Prostate Cancer

From 2000 -2002, prostate cancer was the most frequently diagnosed cancer in black Washington residents; the second most common cancer among whites, Hispanics and non-Hispanics; and the fourth most common cancer among AIANs and APIs. Similar to national patterns, black men in Washington had the highest rates of both incidence and mortality from prostate cancer. Reddy et al. note that blacks in the United States have among the highest rates of prostate cancer in the world.[17] The reasons for this high rate are not known.

Lung and Bronchus

From 2000 – 2002, lung cancer was the second most commonly diagnosed cancer among AIAN and black Washington residents and the third most common cancer among API, white, Hispanic, and non-Hispanic residents. It was the leading cause of cancer death for people in all race and ethnic groups. Among the four race groups, rates of both newly diagnosed lung cancer and death from lung cancer were relatively high for blacks and relatively low for APIs. These are similar to the pattern seen nationally. Hispanics had lower rates of newly diagnosed lung cancer and death from lung cancer compared to non-Hispanics.

Colon and Rectum

From 2000 – 2002, colorectal cancer was the second leading cause of cancer among APIs in Washington; the third most common cancer for AIAN residents; and the fourth leading cause for other groups. There were not pronounced differences in rates by race or ethnicity, although API Washington residents had a somewhat lower rate of death from colorectal cancer compared to people in other groups. This finding is similar to the national pattern, in which the lowest mortality rates from colorectal cancer were observed among API and AIAN residents. Consistent with national statistics, Hispanics had lower rates of newly diagnosed colorectal cancer and death from colorectal cancer compared to non-Hispanics.

Other Types of Cancer

Some types of cancer are not as common as the four types described above, but are nonetheless noteworthy because they are more common in groups that have relatively low rates of cancer overall. Liver and stomach cancers are relatively high among APIs. Hispanics have relatively high rates of non-Hodgkin lymphoma and cancer of the thyroid.

Tables, Charts and Graphs by Race and Ethnicity by Site

This portion of the report contains data on all cancers combined and on the 10 most frequently diagnosed cancer sites for each race and ethnic group, resulting in 15 separate sites. The number of AIAN, API, black and Hispanic Washington residents is relatively small and some types of cancer are not very common. With relatively small numbers, there is often year-to-year variation in rates that appears to be random. To minimize the impact of this variation, we have combined data for 2000 – 2002 for race- and ethnicity-specific information. Additionally, we have not calculated rates and confidence intervals if there are fewer than five cancers for the three-year period and we have not presented stage at diagnosis information when there are fewer than 15 cases for the three years. Information on data sources and definitions is provided in the previous section, Data Definitions and Sources.

For each cancer site, there are tables showing the average annual number of new diagnoses and deaths in Washington for each race and ethnic group. The tables also include age-adjusted rates for both Washington and the United States. We have not provided national incidence rates for AIAN race or for ethnicity. As described in the Background on Race and Ethnicity section, the procedures to improve the completeness of AIAN race and Hispanic ethnicity in WSCR are not used nationally, raising concerns about the comparability of data for these groups. In addition to the tables, charts show the age-adjusted rates for Washington with the 95% confidence intervals. Technical notes applicable to these race- and ethnicity-specific tables and charts are available in Incidence and Mortality Summary. Additionally, Incidence and Mortality Rates by County

covers issues related to small numbers and confidence intervals that are applicable to rates by race and ethnic group.

Additional information is provided for all sites combined and for the five leading causes of cancer for each race and ethnic group, resulting in seven separate cancer sites. These include the four leading causes of cancer that are the same for all race and ethnic groups described in Leading Causes of Cancer by Race and Ethnic Group; liver cancer, the fifth most common cancer among APIs; non-Hodgkin lymphoma, fifth most common among blacks, Hispanics and AIANs. Melanoma is the fifth leading cause of cancer for whites and non-Hispanics. However, we have not included additional information on melanoma, because 1) the data for whites and non-Hispanics are similar to those for all Washingtonians combined and 2) there are too few people with melanoma in the other race and ethnic groups to provide meaningful data. Information on melanoma in Washington is available in the document Cancer by Site.

The additional information for all cancers combined and the five leading causes of cancer for each race and ethnic group includes a chart with stage at diagnosis, a table with national survival rates by stage, and graphs showing trends in Washington since 1992. Technical notes for these tables, charts and graphs are available at Stage at Diagnosis and Incidence and Mortality Rate Trends. As described in “Incidence and Mortality Rate Trends,” coding on the death certificate changed in 1999 such that death rates before 1999 and those from 1999 forward are not entirely comparable. Three-year averages for 1997 – 1999 and 1998 – 2000 would include years from both before and after the coding change and so combining these years is problematic. Therefore, the trend charts for cancer death do not include these time periods.

References

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[8] VanEenwyk J, et al "Notes on Washington State's High Breast Cancer Incidence Rate" Washington State Department of Health, University of Washington Epidemiology Seminar, November 2004

[9] The Behavioral Risk Factor Surveillance System (BRFSS) is a telephone survey of non-institutionalized adults. It is administered in all 50 states, the District of Columbia and Puerto Rico. The Washington BRFSS includes English-speaking people only. Information on the Washington BRFSS is available at http://www.doh.wa.gov/EHSPHL/CHS/CHS-Data/brfss/brfss_homepage.htm .

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[11] Ries LAG, Kosary, CL, Hankey BF, Miller BA, Clegg L, Edwards BK (eds.) SEER Cancer Statistics Review, 1973-1996. National Cancer Institute, Bethesda, MD, 1999

[12] U.S. Department of Health and Human Services. Physical activity and health: a report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, 1996.

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Appendices

Appendix A: Technical Notes

Appendix B: Sources of Additional Information

Appendix A: Technical Notes

Age-Adjustment

Age-adjusted incidence rates were developed using the direct method. They were standardized to the age distributions of the United States 2000 standard population. Following the age-adjustment procedures used by the National Cancer Institute we used five-year age groups in calculating age-adjusted rates. The age distribution of the 2000 US standard population is shown below.

US Standard Population Proportions

age group	2000 proportion
0 - 4	0.0691
5 - 9	0.0725
10 - 14	0.0730
15 - 19	0.0722
20 - 24	0.0665
25 - 29	0.0645
30 - 34	0.0710
35 - 39	0.0808
40 - 44	0.0819
45 - 49	0.0721
50 - 54	0.0627
55 - 59	0.0485
60 - 64	0.0388
65 - 69	0.0343
70 - 74	0.0318
75 - 79	0.0270
80 - 84	0.0178
85+	0.0155

Direct method of age adjustment

Multiply the age-specific rates in the target population by the age distribution of the standard population.

$$\hat{R} = \sum_{i=1}^{m} s_i (d_i / P_i) = \sum_{i=1}^{m} w_i d_i$$

Where m is the number of age groups, d_i is the number of deaths in age group i, P_i is the population in age group i, and s_i is the proportion of the standard population in age group i. This is a weighted sum of Poisson random variables, with the weights being $\left(s_i / P_i\right)$.

Confidence Intervals

Confidence intervals for the age-adjusted rates were calculated with a method based on the gamma distribution (Fay and Feuer, 1997). This method produces valid confidence intervals even when the number of cases is very small. When the number of cases is large the confidence intervals produced with the gamma method are equivalent to those produced with the more traditional methods, as described by Chiang (1961) and Brillinger (1986). The formulas for computing the confidence intervals are given below. Although the derivation of this method is based on the gamma distribution, the relationship between the gamma and Chi-squared distributions allows the formulas to be expressed in terms of quantiles of the Chi-squared distribution, which can be more convenient for computation.

$$\text{Lower Limit} = \frac{v}{2y}\left(\chi^2\right)^{-1}_{\frac{2y^2}{v}}\left(\alpha/2\right)$$

$$\text{Upper Limit} = \frac{v + w_M^2}{2(y + w_M)}\left(\chi^2\right)^{-1}_{\frac{2(y+w_M)^2}{v+w_M^2}}\left(1-\alpha/2\right)$$

where y is the age-adjusted death rate, v is the variance as calculated as shown below, w_M is the maximum of the weights $s_i P_i$, $1-\alpha$ is the confidence level desired (e.g., for 95% confidence intervals, α = 0.05), and $\left(\chi^2\right)^{-1}_x$ is the inverse of the χ^2 distribution with x degrees of freedom.

$$v = \sum_{i=1}^{m} d_i\left(s_i/P_i\right)^2$$

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Chiang, C. L. Standard error of the age-adjusted death rate.*Vital Statistics, Special Reports* 47:271-285, USDHEW, 1961.

Fay, M.P. and Feuer, E.J. Confidence intervals for directly rates: a method based on the gamma distribution. *Stat Med*16:791-801, 1997

Appendix B: Sources of Additional Information

For more information on cancer, risk factors or prevention strategies please refer to the following resources:

1-800-4CANCER: A cancer information service of the National Cancer Institute

American Cancer Society, Western-Pacific Division: 1-800-729-1151 ext. 3307
American Cancer Society. 1998 Cancer Facts and Figures
American Cancer Society website, http://www.cancer.org/

American College of Surgeons National Cancer Database website: http://www.facs.org

Centers for Disease Control and Prevention website: http://www.cdc.gov/cancer/index.htm

Fred Hutchinson Cancer Research Center website: http://www.fhcrc.org/science

National Cancer Institute. Cancer Net: A Service of the NCI, http://cancernet.nci.nih.gov/

National Program of Cancer Registries website: http://www.cdc.gov/cancer/index.htm

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